ways remains some residual unexplained point or observation to sustain the faith. Is there an analogy here with ESP? I enjoy the fun, but must relegate it for the time being to parascience.

At this point in the argument, stuffy zoologists who voice the kind of pompous biases I have expressed are confronted with the miracle of the coelacanth. But the important point about the coelacanth is that the hunt began after Miss Courtnay-Latimer had seen an unusual *specimen* and had shown it to a qualified ichthyologist. No such specimen or even part of one do we have from Loch Ness.

In the complete absence, over centuries, of tangible zoological evidence, we are left with some poorly focused unscaled photographs, verbal accounts of observers given in good faith, and some unexplained sonar echoes (obtained by highly competent teams, e.g. Braithwaite 1968). On the latter point I would remark that, with its steep rocky sides, Loch Ness is a reverberant basin; and I know from personal experience that lateral echoes are easy to pick up on the side-lobes of an echo-sounder's beam. That is the most likely explanation of press pictures of *N* obtained from fishing boat echo-sounders (e.g. *Daily Herald*, London, 7 December 1954), but does not explain Braithwaite's (and other?, *Time*, 20 November 1972) observations. For those, a possibility worth looking into depends on the acoustic-reflective properties of internal waves or regions of shear instability, in particular the steep-fronted internal surges, associated in Loch Ness with short internal waves and described by Thorpe et al. (1972). It is well known that internal density gradients in water (e.g. thermoclines) can be picked up on echo-sounders (Hollan 1966); and the steep and corrugated "fronts" of the Loch Ness surge is a possible, although somewhat far-fetched, explanation of the anomalous echoes. If the even less likely explanation —existence of *N*—turns out to be the correct one, here is one skeptic who will be delighted to be confounded. But some fun would go out of life if the myth of fourteen centuries (from St. Columba to *Time*) were finally laid to rest.

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The Loch Ness monster: Reply to comments of C. H. Mortimer

There is no reason why science cannot be both a serious occupation and also fun to do. The note on the Loch Ness monster was written for fun. We enjoyed writing it and we hope that people enjoyed reading it. But it was never intended to be, nor is it, science fiction. Within the limitations we stated, our reasoning was serious and moderately rigorous. The primary value of the contribution by Scheider and Wallis (1973), in our view, is that it nicely underscores the point that a real question

may be lurking somewhere in the dark, peaty waters of current ecological theory.

We do not know, of course, whether there are monsters in Loch Ness; but we *do* suspect that fairly large organisms could exist in large bodies of freshwater if the food chain behaves itself. We consider it probable that *if* the food webs of oligotrophic lakes and oligotrophic oceans are similar and *if* the standing stock of fish is roughly what we assumed it to be then there exists in Loch Ness (and other large bodies of freshwater) the *potential* for several thousand kilograms of living tissue to exist in relatively large lumps. It would seem to follow from this that even if someone could achieve the philosophically difficult task of proving that such large lumps do not exist in any form in Loch Ness, the apparently valid question of an unrealized potential would still remain to be explained.

When things are looked at from this viewpoint the negative arguments based on the "no tooth, no scale" approach or those based on assumptions concerning the nature of the beast, plesiosaur or otherwise, become irrelevant. As we state in the paper we do not consider the reasoning that because monsters are never caught they do not exist to be valid. The following story is not a parallel to the Loch Ness situation because it deals with things that were known, but it is instructive. There are many anglers in Britain and during the summer it is rare to find any body of water without fishermen (or fisherwomen). As one might expect most of the record catches (in terms of large individuals) are of fairly long standing. Big fish are still caught, but they are no bigger than those caught in the past, with one notable exception. Until the early 1950s a big carp (*Cyprinus carpio*) was 10 lb and the record was 24½. To a gentleman named Richard Walker this did not seem reasonable. There were large carp in Europe and they ought to grow bigger in Britain. He set out to catch a big one and did so. The fish he caught was a *monster* of 44 lb. She is (or was) in the London Zoo and in the late 1950s was well over 50 lb and in the pink of condition. Catching large carp is still an occupation for the dedicated few but 20 and 30 lb *monsters* are now considered to be fairly normal. Where had these big fish been before 1950? There have been carp in Britain for several hundred years and for at least the last 100 years innumerable baits with concealed hooks have been cast hopefully into British lakes. These fish were not caught because no one went about it the right way. Before 1950 these *monsters* were rarely seen and never caught. They lived in well-fished and closely observed bodies of water. Therefore they did not exist??

In conclusion we would like to draw attention to a fact that has recently been pointed out to us. Apparently, the trophic structure of tundra and alpine ecosystems is similar to that of the ocean. Now the tundra is an inhospitable place and it is best left to the musk-ox and other small animals, but the alpine system could be interesting. If we could find data for the standing stock of any trophic level in the Himalayan region we could estimate the population density of the Abominable Snowman.

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